Instruction Sheet

1 July 1953

THESE INSTRUCTIONS WILL REMAIN IN EFFECT ONLY UNTIL THE INFORMATION IS PUBLISHED IN AN OFFICIAL DEPARTMENT OF THE ARMY PUBLICATION.

INSTRUCTIONS
FOR
BATTERY TEST SET
TS-776/U

THE FOLLOWING INFORMATION, PUBLISHED ON ORDER No. 13605-PHILA-53, COVERS BATTERY TEST SET TS-776/U PROCURED ON THAT ORDER.

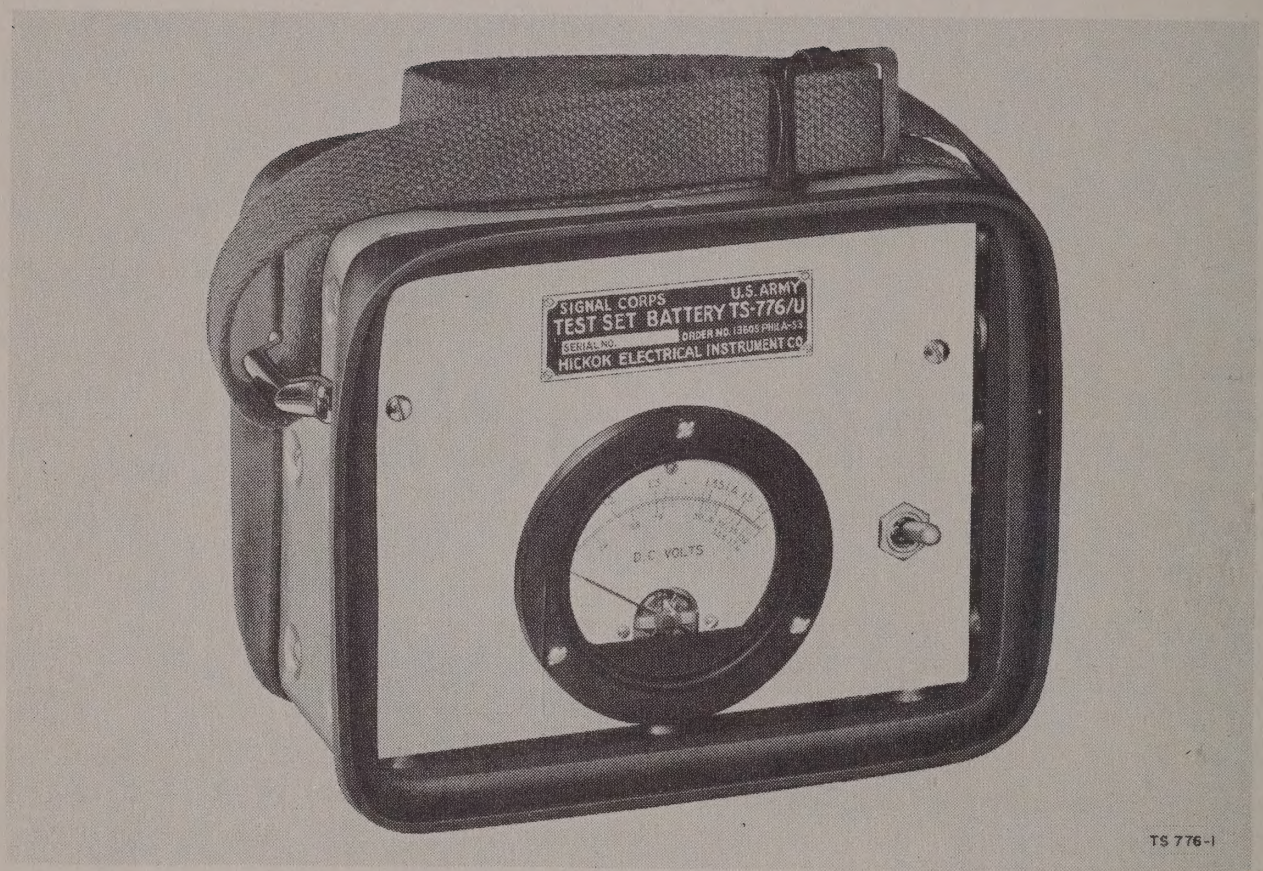

Figure 1. Battery Test Set TS-776/U.

1. SCOPE

a. These instructions are published for the information and guidance of the personnel to whom this equipment is issued. They contain information on the operation and on the organizational and field maintenance of the equipment as well as a description of the equipment and a discussion of the theory of operation. These instructions apply only to Battery Test Set TS-776/U.

b. Appendix I contains a list of current references applicable to the equipment. Appendix II contains an identification table of parts.

2. FORMS AND RECORDS.

The following forms will be used for reporting unsatisfactory conditions of army equipment.

a. DD Form 6, Report of Damaged or Improper Shipment, will be filled out and forwarded as prescribed in SR 745-45-5 (Army), Navy Shipping Guide, Article 1850-4, and AFR 71-4 (Air Force).

b. DA AGO Form 468, Unsatisfactory Equipment Report, will be filled out and forwarded to the Office of the Chief Signal Officer, as prescribed in SR 700-45-5.

c. AF Form 54, Unsatisfactory Report, will be filled out and forwarded to Commanding General, Air Material Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR-700-45-5 and AFR 65-26.

d. Use other forms and records as authorized.

3. GENERAL DESCRIPTION.

Battery Test Set TS-776/U is a complete, self-contained, portable piece of test equipment for checking the terminal voltages of a battery, designated by the Sandia Corporation as Battery MC-193 (a 24- or 25-cell Nickel-Cadmium battery of a 5.5 ampere-hour rating.) It consists of a dual-range voltmeter, a loading resistor, a momentary-contact type toggle switch to control the loading resistor, a battery test lead (W2) terminated in a connector plug (P2), and a cell test lead (W1) terminated in a special test prod (P1). The complete equipment is housed in a stainless steel case and is provided with a webbed carrying strap.

4. PURPOSE AND USE.

Battery Test Set TS-776/U is designed for checking the terminal voltages of Sandia Corporation Battery MC-193. It provides a means for testing the entire battery on open circuit or under a load of approximately 27 amperes and for testing the individual cells on open circuit.

5. DESCRIPTION OF COMPONENTS.

a. VOLTMETER (figs. 1 and 3). The dual range voltmeter (M1) is of the suppressed zero, expanded scale type in a hermetically sealed case. The meter face is inscribed with two calibrated voltage scales: a low range reading from 1.1 to 1.7 volts and a high range reading from 24 to 39 volts. The meter is mounted flush on the recessed front panel of the test set.

Note. Although the last figures on the low and high scales are 1.7 and 39, respectively, the indicating mark at the end of the low scale represents a reading of 1.82 volts and on the high scale 40.6 volts.

b. LOAD RESISTOR (fig. 3). The load resistor (R1) is of the fixed wire-wound power type. It has a resistance of 1.05 ohms with a tolerance of ±.02 ohm and is rated at 240-watt maximum power dissipation.

c. SWITCH (figs. 1 and 3). The load control toggle switch (S1) is a double-pole, single throw, spring return type and normally rests in the open circuit or up position. When the handle of the switch is pushed down, the circuit is closed and load resistor (R1) is connected across the terminals of the battery test lead. The two sections of the switch are wired in parallel to increase the current carrying capacity. The switch is mounted on the recessed front panel.

d. MULTIPLIER RESISTOR (fig. 3). Resistor R2 is of the precision wire-wound type. It has a resistance of 3,000 ohms ±.1 percent and is rated for 1-watt maximum power dissipation. This resistor is connected in series with the meter when the high voltmeter range is in use.

e. CELL TEST PROD LEAD (fig. 2). This lead consists of a length of two-conductor, coiled cord (W1) terminated on one end in the cell test prod (P1) consisting of two heavy metal contacts or prods mounted in a molded plastic handle. Each prod has an axial hole in the end to slip over the cell terminals. The positive prod is identified by a red plastic sleeve and the negative by a black sleeve. The other end of the lead is connected permanently to the test set.

f. BATTERY TEST LEAD (fig. 2). This lead is made up of a length of two-conductor, coiled cord (W2), one end of which is connected permanently to the test set. The other end of the lead is terminated in an AN cable receptacle (P2) to make connection to the total battery.

g. CASE (figs. 1, 2, and 3). The case is made of light gage stainless steel and consists of three sections: the front panel, the rear panel, and the side section. When the equipment is assembled completely, the front and rear panels are recessed below the edges of the side section, and a rubber shock absorber strip is fastened around the perimeter of the front and rear edges. The recessed panels and the shock absorbers provide protection against accidental damage to the equipment.

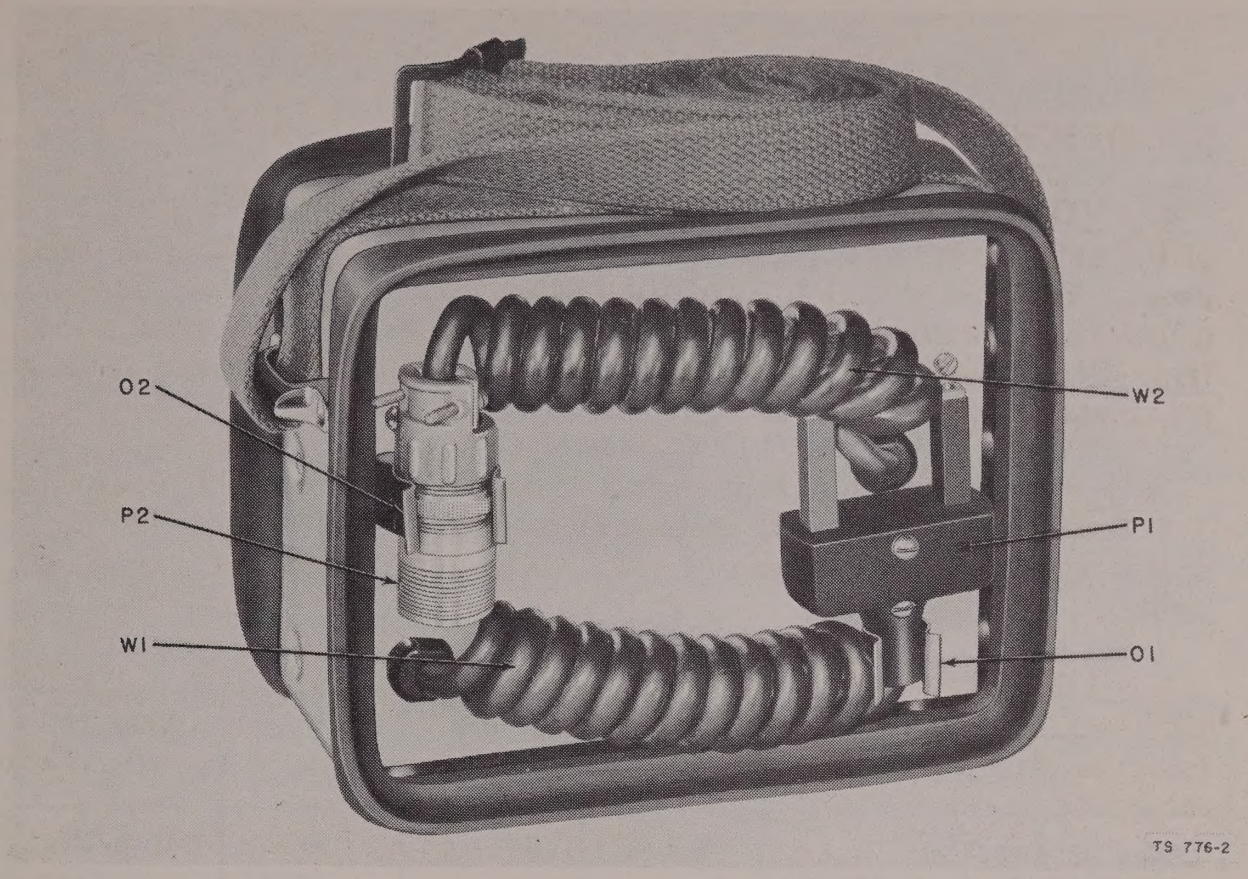

Figure 2. Battery Test Set TS-776/U, rear view

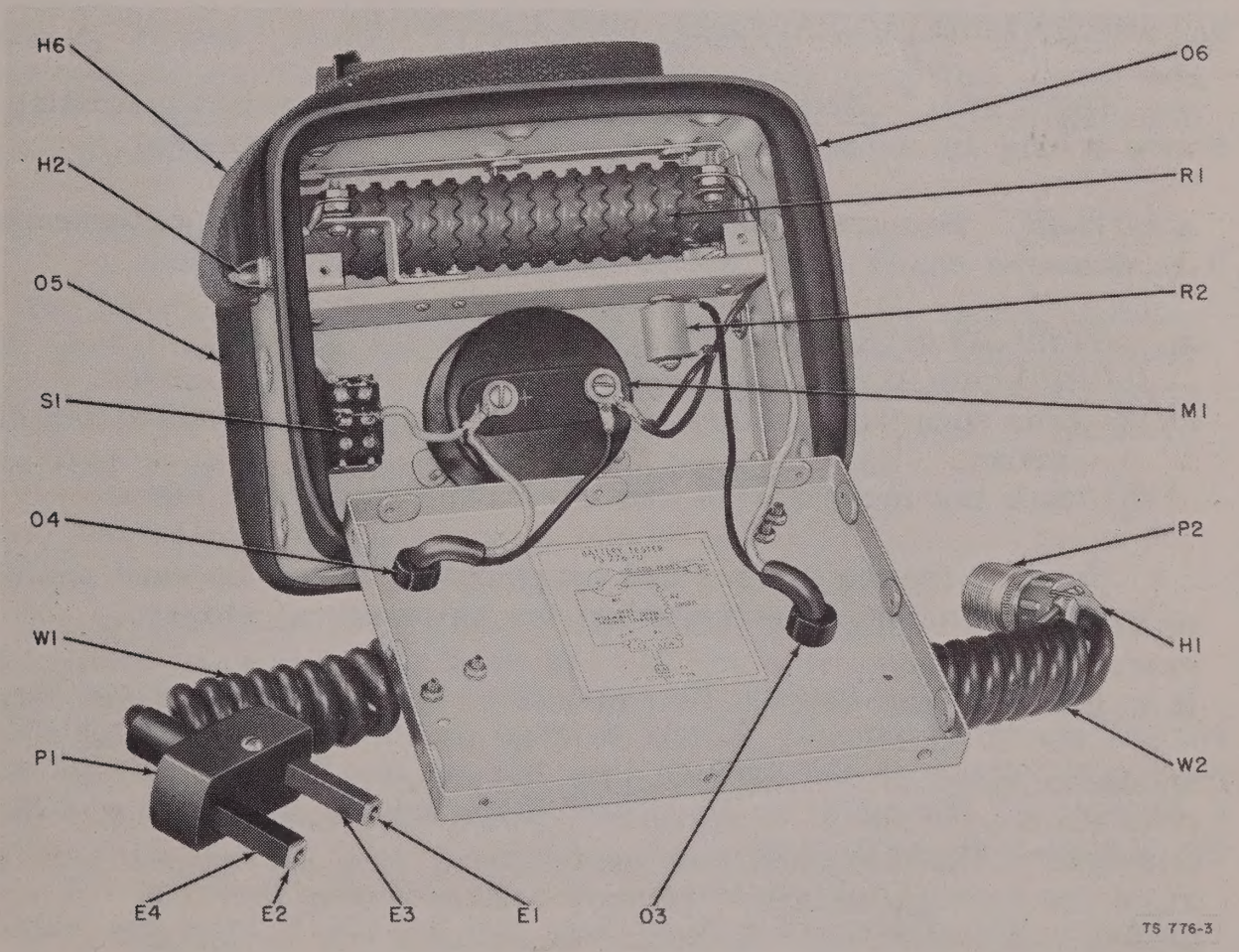

Figure 3. Battery Test Set TS-776/U, interior view, rear panel removed.

6. TECHNICAL CHARACTERISITCS

a. VOLTAGE RANGE, DC.
Using cell test prod lead--1.0 to 1.7 volts.
Using battery test lead--24 to 39 volts.

b. CURRENT RATING UNDER LOAD.
Intermittent load--approximately 27 amperes.

c. POWER CONSUMPTION UNDER LOAD.
Intermittent load--approximately 765 watts.

d. POWER CONSUMPTION. Open Circuit.
Using cell test prod--.021 watt at 1.7 volts.
Using battery test lead--.48 watt at 39 volts.

7. WEIGHT AND DIMENSIONS.

ITEM	Depth (in.)	Width (in.)	Length (in.)	Weight (lb.)
Battery Test Set TS-776/U (unpacked)	4-1/2	6-1/2	8	6-1/2

8. UNCRATING, UNPACKING, AND CHECKING.

a. GENERAL. When the equipment is received, select a location where it may be unpacked without exposure to the elements.

CAUTION. Be careful when unpacking and handling the equipment; it is damaged easily when not protected by its packing case.

b. STEP-BY-STEP INSTRUCTIONS FOR UNPACKING.
(1) Carefully remove the equipment from the outer carton.
(2) Tear open the moisture-vaporproof wrapping around the inner carton.
(3) Open the inner carton and carefully remove the tester.

Note. Save the cartons and wrappings; they can be used again when the equipment is repacked for shipment or storage.

c. CHECKING. Inspect the equipment for possible damage incurred during shipment. If any damage is noted or the equipment does not check with the packing list, fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) in accordance with SR 745-45-5 or AFR 71-4.

Note. The meter of battery Test Set TS-776/U is of the suppressed zero type. The at-rest position of the pointer is at the extreme left of the dial and to the left of the last scale division. This condition is normal and does not indicate a defective meter.

9. INSTALLATION, CONNECTIONS AND INTERCONNECTIONS.

Battery Test Set TS-776/U is a self-contained portable unit and does not require any source of power other than the battery under test, for its operation. It is ready for use as soon as it is removed from the packing carton and no installation, assembly, or interconnection is necessary.

10. CONTROLS.

Battery Test Set TS-776/U has only one control, a toggle switch (S1) located on the front panel at the right of the meter. It is a single-throw switch of the momentary contact spring return type and normally rests in the open-circuit position. In the closed-circuit position a loading resistor (R1) is applied across the battery. This loading circuit is only effective when the battery test lead is in use. To close the circuit and load the battery, press down the handle of the switch. The switch springs back into the open-circuit position when the handle is released.

11. INSTRUMENTS.

Battery Test Set TS-776/U has one indicating instrument, a dual-range voltmeter, located on the recessed front panel. The dial is calibrated in two scales: a low (1.0- to 1.7-volt) scale and a high (24- to 39-volt) scale. In order to provide maximum accuracy of reading at the critical voltage points, the meter is of the suppressed zero, expanded scale type. The meter is housed in a hermetically sealed case.

12. PRELIMINARY PROCEDURE.

Because of the simplicity of the equipment, no special starting or preliminary procedures are necessary. There are no power source requirements, and the only connections necessary are those made to the battery being tested. These connections are made by the test leads permanently attached to the test set.

13. OPERATING PROCEDURES.

a. TESTING INDIVIDUAL CELLS. After charging a battery, allow it to stand on open circuit from 22 to 28 hours at an ambient temperature ranging between +65°F and +90°F; then proceed as follows:

(1) Remove the cell test prod P1 (fig. 2) from its retaining clip on the rear panel.

(2) Apply the test prod across the terminals of the cell with the red prong on the positive (+) terminal and the black prong on the negative (-) terminal. Be sure that the tops of the cell terminal screws are in the holes in the ends of the test prod prongs.

(3) Read the voltage on the low (1.0 to 1.7) voltage scale of the meter. A cell in good condition should have a voltage of at least 1.3 volts.

b. TESTING ENTIRE BATTERY. To test a fully charged battery, proceed as follows:

(1) Make sure that the temperature of the battery is between +65° and +90°F.
(2) Remove the battery test lead connector (P2) from its retaining clip on the rear panel.
(3) Couple the battery test lead connector to the battery connector.
(4) With the loading switch (S1) in the normal open position, read the open circuit voltage. A satisfactory, 24-cell battery will register at least 30 volts (a 25-cell battery will show at least 31.2 volts.)

(5) Hold the handle of the loading switch down for 3 seconds and observe the voltage. At the end of 3 seconds of test load application, the voltage of a 24-cell battery should not drop more than 3.5 volts from open circuit or should not be lower than 29 volts; a 25-cell battery should not drop more than 3.6 volts or be lower than 30.2 volts. A battery which does not meet these criteria may be defective.

Note. When the handle of the loading switch is depressed, a load of approximately 27 amperes is applied to the battery. Because of this load, a completely constant reading cannot be obtained. With the closing of the switch, , a sudden initial drop (from open-circuit voltage to voltage under load) is followed by a slower drop of the voltmeter needle. By holding the loading switch in the depressed position for 3 seconds, a steadier reading will be obtained.

14. WEATHERPROOFING.

Signal Corps equipment, when operated under severe climatic conditions, requires special treatment and maintenance. Fungus growth, dust, insects, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials. A special moistureproofing fungiproofing treatment has been devised, which, if properly applied, provides a reasonable degree of protection. This treatment is fully explained in TB SIG 13 and TB SIG 72.

15. RUSTPROOFING.

To prevent the formation of rust on the equipment, keep all exposed surfaces in good condition. If the equipment is to be exposed to the elements or if it is to be subjected to an extremely damp climate, it may be protected against rust formation by dampening

a cloth with Oil, Lubricating, Preservative, Special (PL Special) and wiping the case.

16. MEANING OF PREVENTIVE MAINTENANCE.

a. Preventive maintenance is a systematic series of operations performed periodically to keep equipment operating at top efficiency. The primary purpose of preventive maintenance is to prevent major break-downs and the consequent need for repair.

b. Preventive maintenance is of utmost importance since the failure or inefficient operation of one piece of equipment may cause the failure of an entire system. It is necessary to inspect the equipment systematically each day that it is operated and at other designated intervals so that defects may be discovered and corrected before they result in serious damage or failure.

17. PREVENTIVE MAINTENANCE SERVICES.

a. MATERIALS FOR MAINTENANCE AND CLEANING. Use the following materials for maintenance and cleaning of the equipment.

Item	Sig. C. Stock No.
Carbon tetrachloride	6G184.1
Cheesecloth	6Z1989
Multimeter TS-297/U	3F4325-297
Sandpaper #0000	6Z7500-0000
Solvent, Dry Cleaning (SD)	6G1914
Tool Equipment TE-41	6R38041

CAUTION: Repeated contact of carbon tetrachloride with the skin or prolonged breathing of the fumes is dangerous. Make sure adequate ventilation is provided. Carbon tetrachloride must always be used for cleaning electrical contacts.

b. WEEKLY MAINTENANCE SERVICE. Because of the simplicity of the equipment and the manner of its construction, weekly maintenance services are not required. If extreme conditions prevail and the local commanding officer considers weekly maintenance necessary, then follow the instructions given for monthly maintenance services in subparagraph c below.

c. MONTHLY MAINTENANCE SERVICES. The preventive maintenance operations listed below should be performed monthly by organizational personnel unless the interval is shortened by the local commanding officer.

(1) Check the glass cover of the meter face; be sure it is not cracked or broken.
(2) Check the cell test prod (P1) for damage or corrosion.
(3) Check the battery connector (P2) for damage or corroded contacts.

(4) Check the coiled cord of each test lead for cracked, cut, or frayed insulation.
(5) Check the loading switch for ease of operation and spring return action.
(6) Check the carrying strap for cuts and fraying.
(7) Remove the 14 screws which hold the rear panel in the case (12 screws around the side of the case and 2 screws on the rear panel) and carefully remove the rear panel.
(8) Blow out all dust or other foreign particles from the inside of the case.
(9) Examine all electrical connections, both mechanical and soldered, for looseness and corrosion.
(10) Check the load resistor (R1) for breaks in the winding, cracks or breaks in the insulation, and loose or damaged terminals.

d. CLEANING.

(1) Clean dirt and corrosion from the prongs of the test prod (P1) with #0000 sandpaper and wipe them clean with a cloth moistened with carbon tetrachloride.
(2) Clean the outside of the case and the meter glass with a cloth moistened with solvent (SD). Wipe them dry with a clean cloth.
(3) Clean dirt and corrosion from battery connector P2 and wipe it clean with a cloth moistened in carbon tetrachloride.

18. MEANING OF TROUBLE SHOOTING.

The primary function of trouble shooting is to locate and correct the cause or causes of faulty operation and equipment failure. All mechanical and electronic equipment is subject to occasional failure. Whenever difficulty is experienced, the operator or repairman must be able to locate and correct the cause as quickly as possible. The trouble chart (par. 20) indicates the various difficulties that are likely to be experienced; symptoms which indicate that trouble exists; the possible cause of the trouble; and the suggested remedy. Reference to various illustrations and diagrams in this manual will aid in localizing the seat of the trouble.

19. CAUSES OF FAILURE.

Faulty operation of Battery Test Set TS-776/U usually is caused by failure of the loading resistor, the loading switch, or the voltmeter or by bad connections.

a. Failure of the voltmeter will result in no reading on either scale.
b. Failure of the loading resistor will result in unchanged reading of the voltmeter when the loading switch is changed from one position to the other.

c. Failure of the loading switch will also result in an unchanged reading when the switch is operated.

d. Corroded, dirty, or loose connections will result in false voltage readings, no reading at all, or intermittent readings.

e. Broken conductors in the test lead cables will result in no reading or intermittent readings.

f. The wiring diagram (fig. 4) should be followed for accuracy in checking the circuit.

NOTE: In some cases a resistance of approximately 50,000 ohms may be connected in parallel with R2 for calibration purposes.

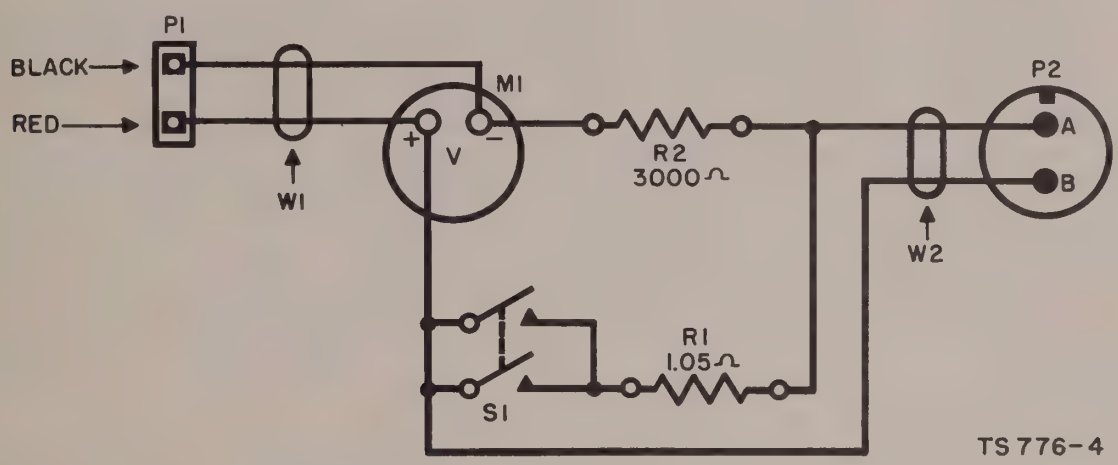

Figure 4. Battery Test Set TS-776/U, Wiring Diagram

20. TROUBLE CHART.

Symptom	Probable Cause	Remedy
Meter does not read on either scale.	Defective meter. Defective wiring.	Replace meter. Check wiring.
Meter reads on low scale only.	Defective multiplier resistor (R2). Defective wiring between battery test lead and meter. Defective battery test lead cable. Defective battery connector P2.	Replace resistor. Check wiring. Replace cable. Replace connector.
Meter reads on high scale only.	Defective cell test lead cable. Defective prod (P1).	Replace cable. Replace or clean and repair prod.
Meter reading does not change when loading switch is depressed.	Defective load resistor (R1). Defective switch. Defective wiring.	Replace resistor. Replace switch. Check wiring.

21. CONTINUITY AND RESISTANCE TESTS.

The following test will be of assistance in checking the equipment for proper operating condition or in localizing the cause of faulty operation.

a. Connect a d-c voltage of approximately 1-1/2 volts across the contact prongs of test prod P1. The meter should read the applied voltage. Disconnect the applied voltage and connect an ohmmeter across P1. The resistance between the contacts of P1 should measure 140 ohms, ±3 ohms.

b. Connect an ohmmeter or multimeter with suitable resistance ranges across the contacts of battery connector P2.

(1) With the loading switch in the normal (up) position the resistance between the contacts of P2 should measure approximately 3,140 ohms.

(2) Depress the loading switch; the resistance between the contacts of P2 should now measure approximately 1 ohm.

22. SHIPMENT AND LIMITED STORAGE.

If the equipment is not to be used for a prolonged period or is to be shipped a considerable distance, follow the instructions in subparagraphs a and b below.

a. RUSTPROOFING. Clean the equipment and inspect it carefully for signs of damage. Rustproof it as instructed in paragraph 15.

b. TROPICALIZATION. The equipment has been treated with a special moistureproofing and fungiproofing compound. After any repair work has been done, treat the equipment in accordance with TB SIG 13 and TB SIG 72.

c. SHIPMENT. After the equipment has been treated as instructed in subparagraphs a and b above, it is ready for shipment or storage. Reverse the instructions in paragraph 8 for packing the equipment.

23. DEMOLITION TO PREVENT ENEMY USE.

When ordered by your Commander, smash the equipment with a sledge, axe, or other suitable heavy object to prevent its being used or salvaged by the enemy. Burn all technical manuals, instruction books and other documents and packing cases.

-- DESTROY EVERYTHING --

APPENDIX I

REFERENCES

Note. For availability of items listed, check SR 310-20-3, SR 310-20-4, and SR 310-20-5. Check Department of the Army Supply Manual SIG 1, Introduction and Index, for Signal Corps Supply Manuals.

1. ARMY REGULATIONS

AR 380-5	Military Security (Safeguarding Security Information).
AR 750-5	Maintenance of Supplies and Equipment (Maintenance Responsibilities and Shop Operation).

2. SUPPLY BULLETINS

SB 11-47	Preparation and Submission of Requisitions for Signal Corps Supplies.
SB 11-100	Serviceability Standards for Signal Equipment in Hands of Troops.

3. AUXILIARY EQUIPMENT AND TEST EQUIPMENT.

TM 11-4700	Electrical Indicating and Measuring Instruments, Repair Instructions.

4. PAINTING, PRESERVING, AND LUBRICATION.

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 72	Tropical Maintenance of Ground Signal Equipment.

5. CAMOUFLAGE, DECONTAMINATION, AND DEMOLITION.

FM 5-20	Camouflage, Basic Principles.
FM 5-25	Explosives and Demolitions.
TM 3-220	Decontamination.

6. OTHER PUBLICATIONS.

SR 310-20-3	Index of Training Publications.

SR 310-20-4	Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
SR 310-20-5	Index of Administrative Publications.
SR 700-45-5	Unsatisfactory Equipment Report (Reports Control Symbol CSGLD-247).
SR 745-45-5) Navy Shipping) Guide, Article) 1850-4) AFR 71-4)	Report of Damaged or Improper Shipment (Reports Control Symbols CSGLD-66 (Army), SandA-70-6 (Navy), and AF-MC-U2 (Air Force).
TB SIG 66	Winter Maintenance of Signal Equipment.
TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TB SIG 123	Preventive Maintenance Practices for Ground Signal Equipment.
TB SIG 219	Operation of Signal Equipment at Low Temperatures.

APPENDIX II

IDENTIFICATION TABLE OF PARTS

Note. The following is an identification table of parts for Battery Test Set TS-776/U (Sig. C stock No. 3F4325-776). The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as a specific T/O&E, T/A, SIG 7 & 8, list of allowances of expendable material, or another authorized supply basis. The Department of the Army Supply Manual applicable to the equipment covered in this instruction sheet is SIG 7 & 8 TS-776/U. For an index of available supply manuals in the Signal portion of the Department of the Army-Supply Manual, see the latest issue of SIG 1, Introduction and Index.

IDENTIFICATION TABLE OF PARTS

Ref. Symbol	Name of part and description	Function of part	Signal Corps Stock No.
O5, O6	ABSORBER, shock: black rubber; rectangular; approx 8" lg x 6-5/8" wd x 7/8" thk o/a; inside dimen approx 7-5/32" lg x 5-25/32" wd; Hickok part/dwg. No. 19200-10.	O5: Protective guard for front panel, switch, and meter. O6: Protective guard for rear panel and leads.	2Z142-22
W1, W2	CABLE ASSEMBLY: power, electrical; two cond. stranded, 41 strands #36 AWG, neoprene ins; Whitney Blake Co., Koiled Kord Type 8011 per Hickok part/dwg No. 3675-21.	W1: Part of battery test lead. W2: Part of cell test lead.	3E4000.164
H1	CLAMP, electrical: 2 screw type for 5/8" cable; ANA type; AN-3057-8; Hickok part/dwg No. 3275-175.	Secures battery test connector P2 to cable.	2Z2636-1
O1	CLIP: ferrule; holds material 5/8" to 11/16" dia; Hickok part/dwg 3300-55.	Secures cell connector prod in case when not in use.	3Z1029-26
O2	CLIP: ferrule; holds material 1-1/16" to 1-1/8" dia; Hickok part/dwg No. 3300-56.	Secures battery connector plug in case when not in use.	3Z1029-26.1
P1	CONNECTOR, plug: two; female; round 3/16" ID cont; 3-1/4" lg x 2-1/4" wd x 1" thk "T" shape; phenolic; contacts color coded, one red and one black; Hickok part No. 3475-50.	Termination for cell test lead.	2Z3056-33
P2	CONNECTOR, plug: two; male; round cont; polarized; 1-7/8" lg, 1" dia; cylindrical; aluminum; 11/16" dia max cable opening 1" -20 coupling nut thread on one end, 7/8" -20 conduit thread on other end; ANA type AN30101A-16-11P; American Phenolic Corp; type No. AN3101A-16-11-P; Hickok part No. 3475-49.	Termination for battery test lead, couples to mating connector on battery.	2Z3022-205

IDENTIFICATION TABLE OF PARTS (Contd.)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
E1, E2	CONTACT, electrical: SS; .312" sq x 2-1/6" lg; axial hole in end 3/16" dia x 11/16" to engage battery cell cont; Hickok part/dwg No. 3525-91.	E1: Part of cell test prod lead; connects to positive terminal of cell. E2; Part of cell test prod lead; connects to negative terminal of cell.	2Z3193-223
E3	INSULATION, sleeving, electrical: plastic; .294" ID red; Irvington Varnish & Insulator Co.; Irv-o-Lite XTE-30 Red; Hickok part No. 20950-52.	Insulating and identifying sleeve for positive contact of cell test prod.	3G2201-1.1
E4	INSULATION, sleeving, electrical: plastic; .294" ID; black; Irvington Varnish and Insulating Co.; Irv-o-Lite XTE-30 Black; Hickok part No. 20950-53.	Insulating and identifying sleeve for negative contact of cell test prod.	3G2201-1
O3, O4	INSULATOR, bushing: plastic, nylon, black; round, two-piece constr; .725" dia, .687" lg; single mtg hole .625" dia; Heyman Mfg. Co., type SR-6P; Hickok part No. 3275-156.	O3: Protective bushing between battery test lead and panel. O4: Protective bushing between cell test lead and panel.	3G100-222
R1	RESISTOR, fixed: WW; 1.05 ohms; 240 w; 6-1/2" lg, 1-3/8" dia; 2 term., lug type; Ward Leonard, Ribflex; Hickok part No. 18575-125.	Load resistor for total battery test.	3Z5991-138
R2	RESISTOR, fixed: WW; 3000 ohms; 1 w; 2-1/16" lg, 7/8" dia; two term., solder lug type; Resistance Products Co., type ALP; Hickok part No. 18575-124.	Multiplier resistor for total battery voltage scale.	3RB5-3000.5

IDENTIFICATION TABLE OF PARTS (Contd.)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
H6	STRAP, carrying; olive drab cotton webbing; 6' lg x 1-1/16"wd x 1/8" thk; Hickok part No. 19800-19.	Carrying strap for test set.	6Z8448-33
S1	SWITCH, toggle: DPST; 30 amp; 30 v d-c; 1-5/16" lg x 3/4" wd x 25/32" d; bat type handle; 11/32" lg; momentary action; normally open; four term., solder lug type; JAN type ST-52M; Cutler-Hammer Inc. part No. 8827K5; Hickok part No. 19911-48.	Control switch for battery loading resistor R1.	3Z9863-52M
M1	VOLTMETER: panel mtd; 1.0 to 1.7 d-c volts; round, steel flange, 3-1/2" dia, 3/8" thk; body 2-3/4" dia; Hickok model 46RHS, style No. 461-183.	Voltage indicator.	3F7941G7

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